

Application No. 10/567,976
Paper Dated: January 29, 2010
In Reply to USPTO Correspondence of September 30, 2009
Attorney Docket No. 5038-060390

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1.-12. (Cancelled)

13. (Currently Amended) A polyelectrolyte composition for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups, wherein the at least one compound containing cross-linking functional groups is a compound selected from the group consisting of halogen-containing carboxylic acids, amine-containing alcohols and amine-containing carboxylic acids, or a mixture thereof.

14. (Previously Presented) The polyelectrolyte composition according to claim 13, wherein the diamine-based compound is a compound selected from the group consisting of *N,N,N',N'-tetramethylaminoethane, N,N,N',N'-tetraethylaminoethane, N,N,N',N'-tetramethyl-1,3-propanediamine, N,N,N',N'-tetraethyl-1,3-propanediamine, N,N,N',N'-tetramethyl-1,4-butanediamine, N,N,N',N'-tetraethyl-1,4-butanediamine, N,N,N',N'-tetraethyl-2-butene-1,4-diamine, N,N,N',N'-tetraethyl-2-butene-1,4-diamine, 1,3-bis(dimethylamino)-2-propanol, 1,3-bis(diethylamino)-2-propanol, N,N,N',N'-tetramethyl-1,3-diaminobutane, N,N,N',N'-tetraethyl-1,3-diaminobutane, 1,3-di(4-pyridyl)propane, 4,4'-bipyridyl, 2,2'-bipyridyl, 1,4-diazabicyclo[2.2.2]octane, N,N'-dimethylpiperazine, N,N'-dimethyl-1,3-di(4-piperidyl)propane, pyrazine, pyrazine amide, 4-(N,N'-dimethylamino)pyridine, N,N,N',N'-tetramethyl-1,5-pentanediamine, N,N,N',N'-tetraethyl-1,5-pentanediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N,N',N'-tetraethyl-1,6-hexanediamine, or a mixture of two or more of them.*

15. (Currently Amended) The polyelectrolyte composition according to claim 13, wherein the dihaloalkane is a compound selected from the group consisting of

compounds containing two halogen atoms, such as chlorine, bromine and iodine in alkyl group having 1 to 18 carbon atoms, wherein the cyclic compounds having have 5 to 6 carbon atoms and containing contain two halogen atoms and a mixture of two or more of them, such as, 1,4-dichloro-2-butene, 1,4-dibromo-2-butene, 1,3-dichloro-2-propanol, 1,3-dibromo-2-propanol, 2,3-dichloropropanol, 1,3-dichloropropanone, 1,3-dibromopropanone, 1,4-dichloro-2-butanol, bis-2-chloroethyl ether, bis-2-bromoethyl ether, 1,2-bis(2-chloroethoxy)ethane, 1,2-bis(2-bromoethoxy)ethane, 1,3-dichloroacetone, 1,3-dibromoacetone, α,α' -dichloro-o-xylene, α,α' -dichloro-m-xylene, α,α' -dichloro-p-xylene, α,α' -dibromo-o-xylene, α,α' -dibromo-m-xylene and α,α' -dibromo-p-xylene.

16. (Cancelled)

17. (Currently Amended) The polyelectrolyte composition according to claim 13 [[16]], wherein the halogen-containing alcohol is a compound selected from the group consisting of alcohol compounds containing one halogen atom, such as chlorine, bromine or iodine in alkyl group having 2 to 18 carbon atoms or a mixture thereof and wherein the amine-containing alcohol is a compound selected from the group consisting of 2-aminoethanol, 3-aminopropanol, 2-aminopropanol, amino-2-propanol, aminobutanol, aminocyclohexanol, 2-(ethylamino)ethanol, 2-(methylamino)ethanol, diethanolamine, triethanolamine, *N,N*-dimethylaminoethanol, *N,N*-diethylaminoethanol, *N,N*-dibutylaminoethanol, *N,N*-dimethylaminopropanol, *N,N*-diethylaminopropanol, 3-pyrrolidinol, 1-methyl-3-pyrrolidinol, 1-methyl-2-pyrrolidylethanol, 3-hydroxypiperidine, 4-hydroxypiperidine, and 1-(2-hydroxyethyl)piperazine, or a mixture thereof.

18. (Currently Amended) The polyelectrolyte composition according to claim 13 [[16]], wherein the halogen-containing carboxylic acid is a compound selected from the group consisting of carboxylic acids containing one halogen atom, such as chlorine, bromine or iodine and having 2 to 18 carbon atoms, or a mixture thereof.

19. (Currently Amended) The polyelectrolyte composition according to claim 13 [[16]], wherein the amine-containing carboxylic acid is a compound selected from the group consisting of amino acids containing 2 to 18 carbon atoms, or a mixture thereof.

20. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition ~~according to claim 13, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups;~~ 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant.

21. (Previously Presented) The polyelectrolyte ink according to claim 20, wherein the cross-linking agent is selected from the group consisting of diisocyanate, methylol melamine, methylol urea, blocked isocyanate, aziridine, oxazoline, epoxy, diaminoalkane and carbodiimide cross-linking agent.

22. (Cancelled)

23. (Currently Amended) A process for preparing a humidity sensor, wherein a polyelectrolyte ink is spread using an inkjet printing mode and then treated with heat to form a humidity sensitive membrane~~The process for preparing the humidity sensor according to claim 22, wherein a polyelectrolyte ink comprising 10-50 wt% of a polyelectrolyte composition having 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups[[,]]; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant is spread on a board having electrodes thereon and then treated with heat at 50-200°C to form the humidity sensitive membrane.~~

24. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition ~~according to claim 14, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant., wherein the diamine-based compound is a compound selected from the group consisting of N,N,N',N'-tetramethylaminoethane, N,N,N',N'-tetraethylaminoethane, N,N,N',N'-tetramethyl-1,3-propanediamine, N,N,N',N'-tetraethyl-1,3-propanediamine, N,N,N',N'-tetramethyl-1,4-butanediamine, N,N,N',N'-tetraethyl-1,4-butanediamine, N,N,N',N'-tetramethyl-2-butene-1,4-diamine, N,N,N',N'-tetraethyl-2-butene-1,4-diamine, 1,3-bis(dimethylamino)-2-propanol, 1,3-bis(diethylamino)-2-propanol, N,N,N',N'-tetramethyl-1,3-diaminobutane, N,N,N',N'-tetraethyl-1,3-diaminobutane, 1,3-di(4-pyridyl)propane, 4,4'-bipyridyl, 2,2'-bipyridyl, 1,4-diazabicyclo[2.2.2]octane, N,N'-dimethylpiperazine, N,N'-dimethyl-1,3-di(4-piperidyl)propane, pyrazine, pyrazine amide, 4-(N,N'-dimethylamino)pyridine, N,N,N',N'-tetramethyl-1,5-pentanediamine, N,N,N',N'-tetraethyl-1,5-pentanediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N,N',N'-tetraethyl-1,6-hexanediamine, or a mixture of two or more of them.~~

25. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition ~~according to claim 15, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant., wherein the dihaloalkane is a compound selected from the group consisting of compounds containing two halogen atoms in~~

alkyl group having 1 to 18 carbon atoms, cyclic compounds having 5 to 6 carbon atoms and containing two halogen atoms and a mixture of two or more of them.

26. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition according to claim 16, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant, wherein the at least one compound containing cross-linking functional groups is a compound selected from the group consisting of halogen-containing alcohols, halogen-containing carboxylic acids, amine-containing alcohols and amine-containing carboxylic acids, or a mixture thereof.

27. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition according to claim 17, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant, wherein the halogen-containing alcohol is a compound selected from the group consisting of alcohol compounds containing one halogen atom in alkyl group having 2 to 18 carbon atoms or a mixture thereof and wherein the amine-containing alcohol is a compound selected from the group consisting of 2-aminoethanol, 3-aminopropanol, 2-aminopropanol, amino-2-propanol, aminobutanol, aminocyclohexanol, 2-(ethylamino)ethanol, 2-(methylamino)ethanol, diethanolamine, triethanolamine, N,N-dimethylaminoethanol, N,N-diethylaminoethanol, N,N-dibutylaminoethanol, N,N-dimethylaminopropanol, N,N-diethylaminopropanol, 3-pyrrolidinol, 1-methyl-3-pyrrolidinol, 1-methyl-2-pyrrolidylethanol, 3-hydroxypiperidine, 4-hydroxypiperidine, and 1-(2-

hydroxyethyl)piperazine, or a mixture thereof.

28. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition according to claim 18, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant, wherein the halogen-containing carboxylic acid is a compound selected from the group consisting of carboxylic acids containing one halogen atom and having 2 to 18 carbon atoms, or a mixture thereof.

29. (Currently Amended) A polyelectrolyte ink, comprising 10-50 wt% of a polyelectrolyte composition according to claim 19, for a humidity sensitive membrane of a humidity sensor, comprising 35-50 wt% of at least one compound selected from diamine-based compounds, 45-64.9 wt% of at least one compound selected from dihaloalkane-based compounds, and 0.1-5 wt% of at least one compound containing cross-linking functional groups; 1-10 wt% of a cross-linking agent[[,]]; 38-88.9 wt% of an organic solvent[[,]]; and 0.1-2 wt% of a mixture of a non-ionic surfactant and an ionic surfactant, wherein the amine-containing carboxylic acid is a compound selected from the group consisting of amino acids containing 2 to 18 carbon atoms, or a mixture thereof.

30. (NEW) The polyelectrolyte composition according to claim 15, wherein the halogen atom is selected from the group consisting of chlorine, bromine and iodine.

31. (NEW) The polyelectrolyte composition according to claim 15, wherein the dihaloalkane is selected from the group consisting of 1,4-dichloro-2-butene, 1,4-dibromo-2-butene, 1,3-dichloro-2-propanol, 1,3-dibromo-2-propanol, 2,3-dichloropropanol, 1,3-dichloropropanone, 1,3-dibromopropanone, 1,4-dichloro-2-butanol, bis-2-chloroethyl ether, bis-2-

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bromoethyl ether, 1,2-bis(2-chloroethoxy)ethane, 1,2-bis(2-bromoethoxy)ethane, 1,3-dichloroacetone, 1,3-dibromoacetone, α,α' -dichloro-o-xylene, α,α' -dichloro-m-xylene, α,α' -dichloro-p-xylene, α,α' -dibromo-o-xylene, α,α' -dibromo-m-xylene and α,α' -dichloro-p-xylene.

32. (NEW) The polyelectrolyte composition according to claim 18, wherein the halogen atom is selected from the group consisting of chlorine, bromine and iodine.

33. (NEW) The polyelectrolyte ink according to claim 25, wherein the halogen atom is selected from the group consisting of chlorine, bromine and iodine.

34. (NEW) The polyelectrolyte ink according to claim 25, wherein the dihaloalkane is selected from the group consisting of 1,4-dichloro-2-butene, 1,4-dibromo-2-butene, 1,3-dichloro-2-propanol, 1,3-dibromo-2-propanol, 2,3-dichloropropanol, 1,3-dichloropropanon, 1,3-dibromopropanon, 1,4-dichloro-2-butanol, bis-2-chloroethyl ether, bis-2-bromoethyl ether, 1,2-bis(2-chloroethoxy)ethane, 1,2-bis(2-bromoethoxy)ethane, 1,3-dichloroacetone, 1,3-dibromoacetone, α,α' -dichloro-o-xylene, α,α' -dichloro-m-xylene, α,α' -dichloro-p-xylene, α,α' -dibromo-o-xylene, α,α' -dibromo-m-xylene and α,α' -dichloro-p-xylene.

35. (NEW) The polyelectrolyte ink according to claim 27, wherein the halogen atom is selected from the group consisting of chlorine, bromine and iodine.

36. (NEW) The polyelectrolyte ink according to claim 28, wherein the halogen atom is selected from the group consisting of chlorine, bromine and iodine.